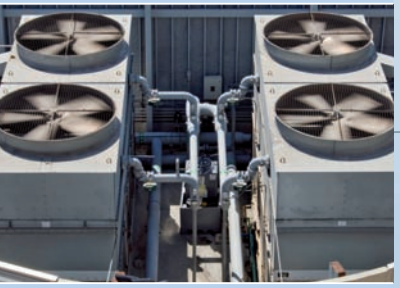
# Efficient Semiconductor Solutions for Motor Control and Drives Applications

[www.infineon.com/motorcontrol]



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# Efficient Semiconductor Solutions for Motor Control and Drives Applications

REDUCE YOUR OVERHEAD by capitalizing on the integration capabilities and functionality of Infineon's motor control solutions. Our extensive portfolio covers a wide range of voltage and power classes, supporting a broad application spectrum across the industrial, consumer and automotive markets.

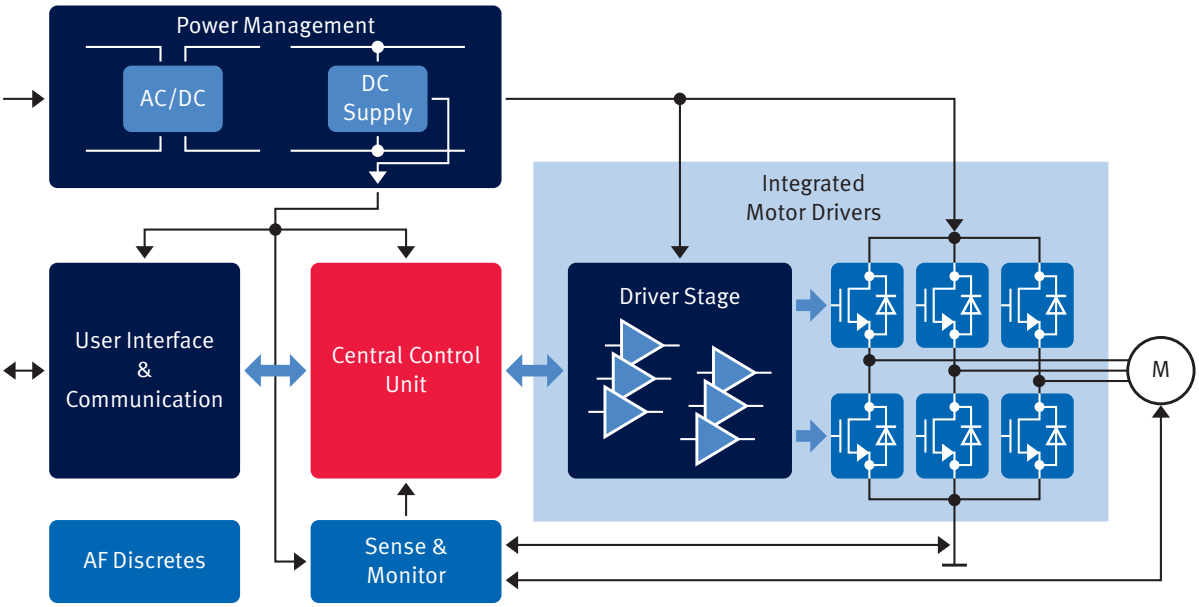
This guide showcases the full range of products spanning, microcontrollers, gate drivers, MOSFETs, IGBTs, voltage regulators, sensors, integrated bridge driver ICs, integrated power modules and high-power modules.

With our power products and microcontrollers, you can design efficient, robust and cost-effective control units for virtually all types of motors, from brushless DC and permanent magnet synchronous motors, through induction and stepper motors to switched reluctance motors.

We complement this vast product offering with excellent customer support from our application experts, technical documentation and online education. We also deliver a variety of evaluation and application kits supporting all motor designs. Each application kit comes with a reference code and instructions, along with all the software you need to start and successfully complete your design as rapidly as possible.

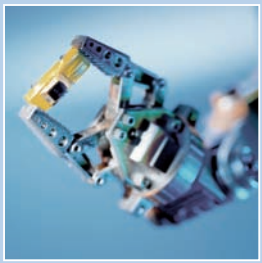
We hope you enjoy exploring the benefits of our efficient semiconductor solutions for motor control and drives applications.

## Typical Motor Control Block Diagram

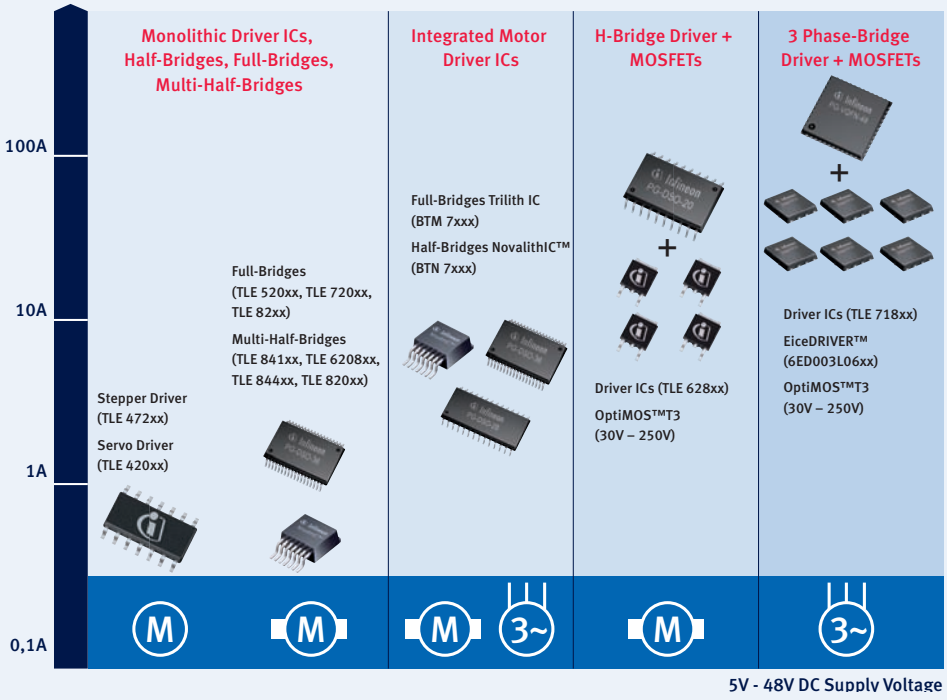


# Application Solutions for Motor Control and Drives

## Low-Voltage Applications



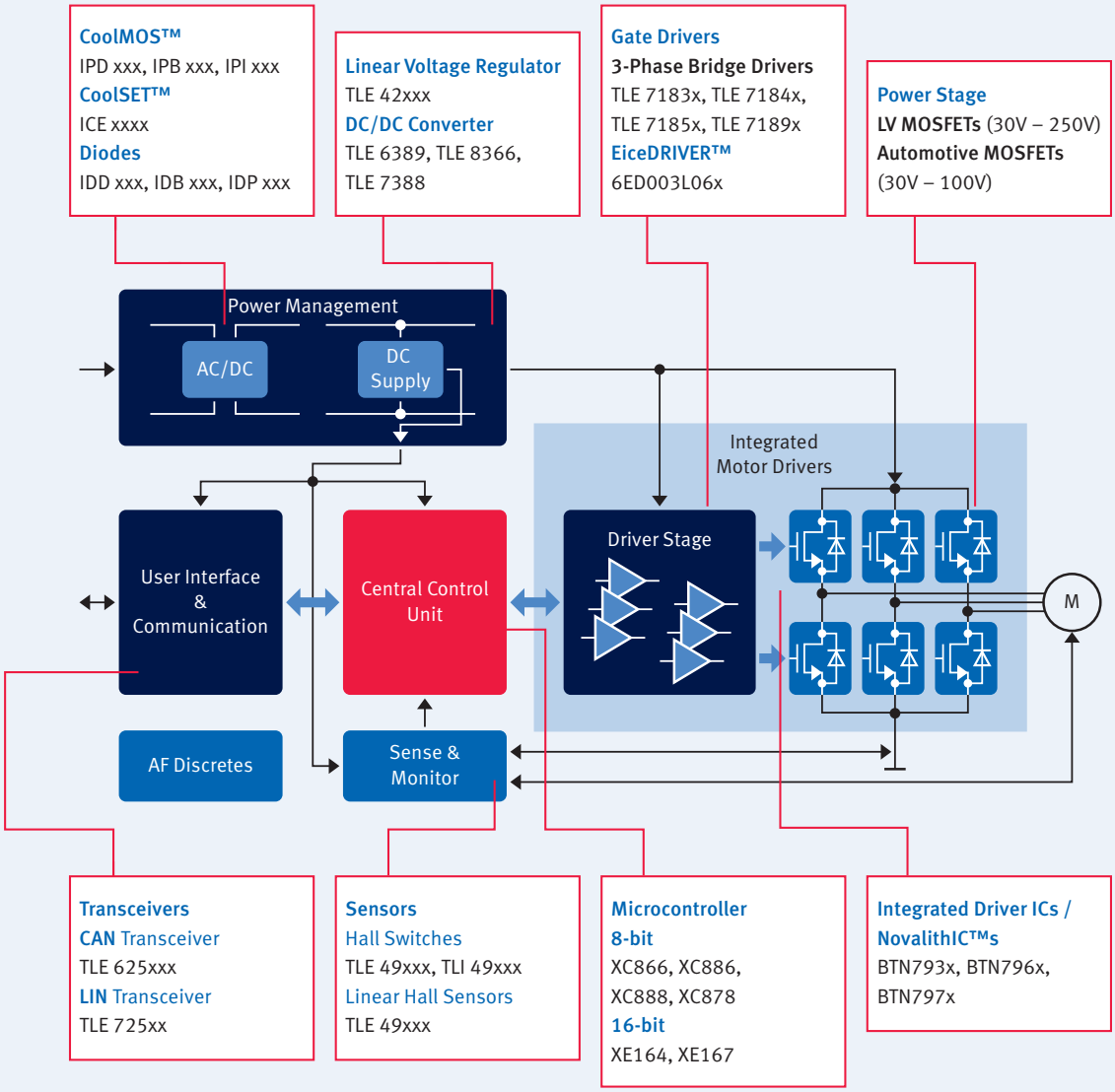
INFINEON IS THE PARTNER OF CHOICE when it comes to drive solutions for low-voltage motors. Across the full current range from 0.1 to 100A and across the entire application spectrum from steppers to 3-phase drivers, you can rely on us to provide the perfect fit.




**Infineon's solutions cover a broad range of target applications including**

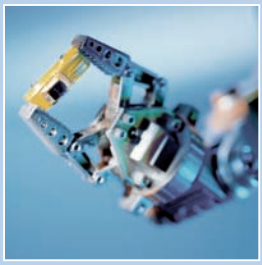
- Pumps (fuel, heating, water)
- Fans / blowers
- Battery-driven vehicles (e.g. ebike)
- Automotive applications
- Truck / transportation
- Forklift
- Scooters
- Wheelchairs
- Industrial drives
- Robotics
- Door openers
- Power tools, cordless power tools
- Gardening tools
- Small robots (cleaning robots)
- Electric toys
- Kitchen machines / food processors / coffee machines

Infineon offers products and solutions for the main parts of motor control applications. The block diagram shows an example of a 3-phase BLDC motor drive.



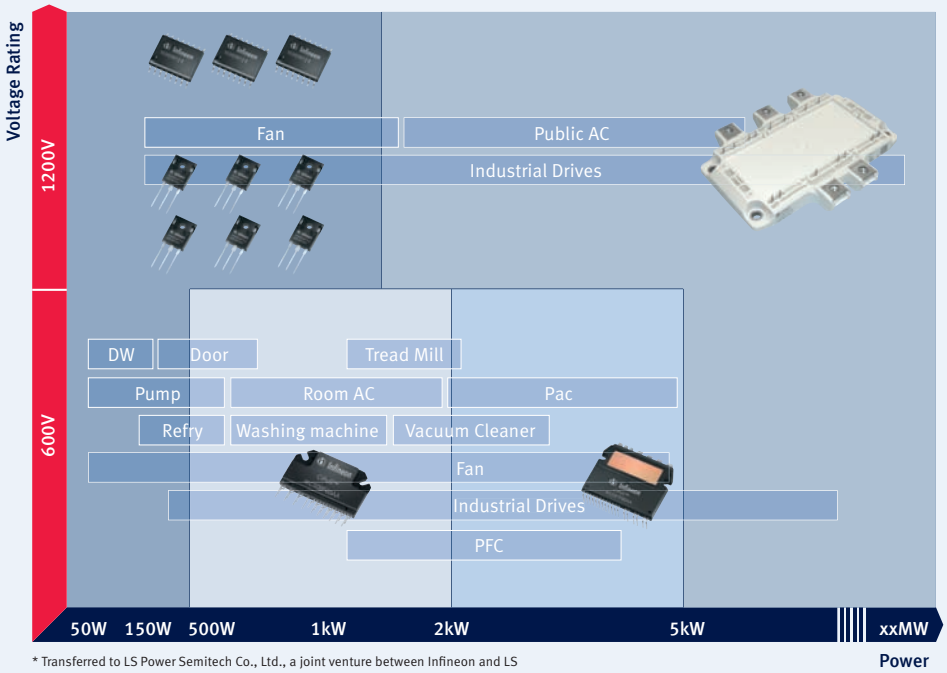
# Application Solutions for Motor Control and Drives

## High-Voltage Applications



WITH OUR GATE DRIVER ICs, discrete IGBTs, integrated modules and high-power modules Infineon covers the whole range of power classes for high-voltage drives. We offer optimized, cost-effective solutions for each power class.

**Discrete IGBTs, EiceDRIVER™s, CIPOS™* and Modules**

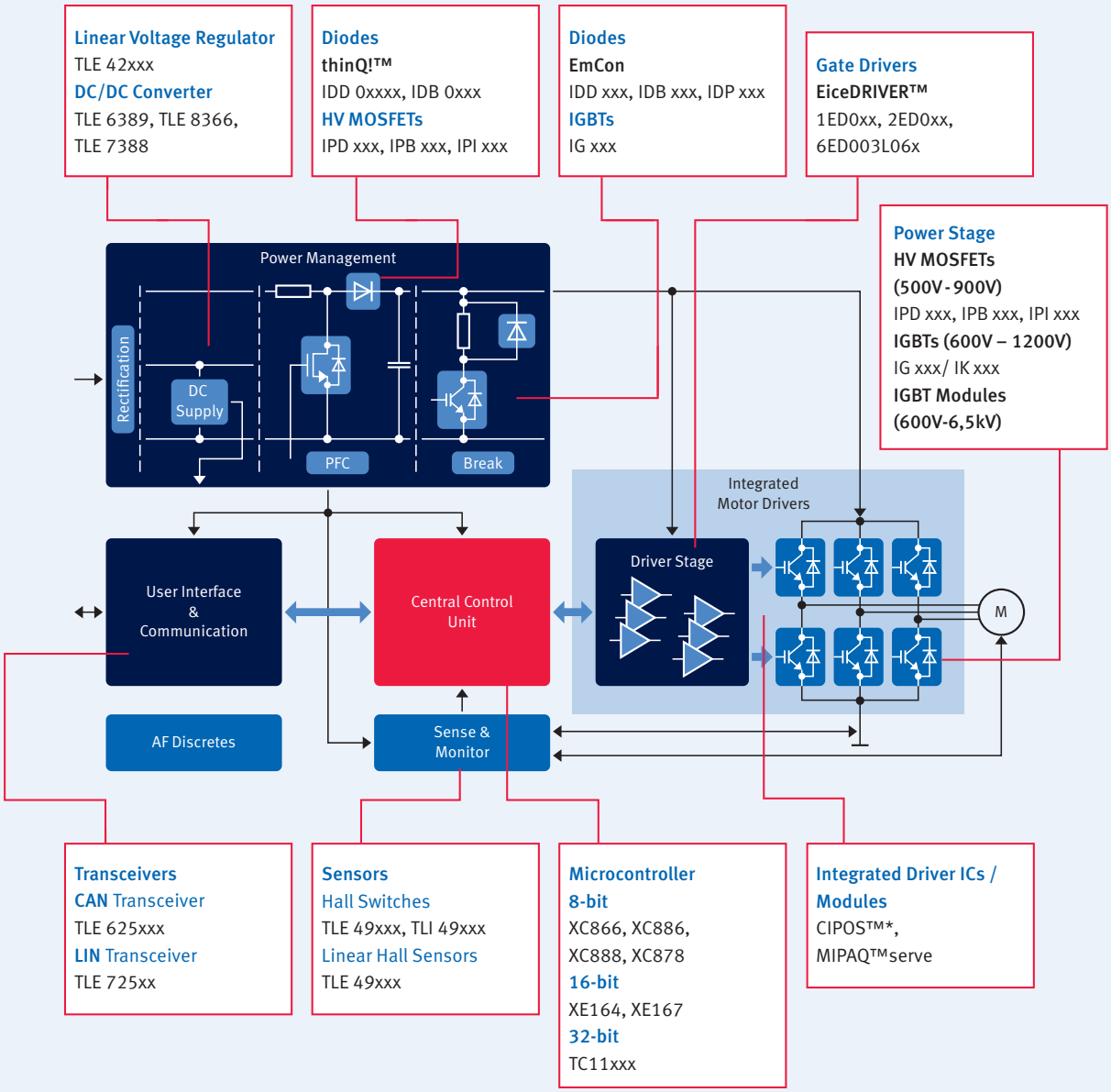



* Transferred to LS Power Semitech Co., Ltd., a joint venture between Infineon and LS

**Infineon's solutions cover a broad range of target applications including**

- Pumps
- Fans / blowers
- Compressors
- Industrial drives
- Robotics
- Air conditioning
- Washing machines
- Dish washers
- Refrigeration
- Kitchen Hoods
- Vacuum cleaners
- Door openers

Infineon offers products for the main blocks of high-voltage motor drive applications. The block diagram provides an overview of the product portfolio for high-voltage products.




*Transferred to LS Power Semitech Co., Ltd., a joint venture between Infineon and LS

# Choosing the Right Microcontroller

## XC800 (8-bit)

| MCU Feature | Control Scheme | Load Behavior | Application |
|---|---|---|---|
| ■ Vector computer (MDU + Cordic)<br>■ 1 x CCU6<br>■ 1 x ADC | ■ Sensorless FOC<br>■ Trapezoidal Hall<br>■ Trapezoidal sensorless<br>■ V/F<br>■ Open loop | ■ Low noise<br>■ Variable load<br>■ Variable speed<br>■ Known load dynamics (look-up table) | ■ HVAC fans<br>■ Domestic heating pumps<br>■ Valve control<br>■ Washing machines<br>■ eBike |

**XC800 family**

- Reduced system cost
- Flash from 4KB to 64KB
- Pin counts from 20-TSSOP to 64-QFP
- CapCom6 (CCU6) – PWM generation
  - Two 16-bit timers
  - Control of three half-bridges
  - Special modes for motor control
  - ADC hardware linked to PWM
- 16-bit vector computer for FOC (vector) control-nested execution of CoRDIC & MDU
- Flexible interfaces, high-speed synchronous, communication (SPI compatible)
- UARTs
- MultiCAN
  - Two CAN nodes
  - 32 message objects
- ADC
  - 10-bit, 1.5 usec
  - PWM sync. trigger
  - Multiple result registers
- EN/IEC60335-1 class B standard

## XE166 (16-bit)

| MCU Feature | Control Scheme | Load Behavior | Application |
|---|---|---|---|
| ■ MAC unit<br>■ 2 x ADC<br>■ 4 x CCU6 | ■ Direct torque<br>■ Resolver FOC<br>■ Encoder FOC<br>■ Sensorless FOC | ■ Highest dynamic load response<br>■ Accurate positioning<br>■ High speed<br>■ Dynamic load response<br>■ Speed control | ■ GP inverters, Elevator,<br>■ Spindle drives,<br>■ Transportation assembly lines,<br>■ PLC, Servo, CNC |

**XE166 family**

- Realtime digital signal controller
- Flash from 192KB to 1.6MB
- Pin counts from 64-LQFP to 176-LQFP
- 16-bit MAC unit with DSP libraries
- CapCom6 (CCU6) – PWM generation
  - Two 16-bit timers
  - Control of three half-bridges
  - Special modes for motor control
  - 16-bit vector computer for FOC
  - ADC hardware linked to PWM
- Flexible interfaces
  - High-speed synchronous
  - Communication (SPI compatible)
  - USICs
  - UARTs
- MultiCAN
  - Up to five CAN nodes
  - Up to 128 message objects
- Safety integrating level 3

## TC11xx (32-bit)

| MCU Feature | Control Scheme | Load Behavior | Application |
|---|---|---|---|
| ■ 2 MAC units<br>■ GTPA unit for PWM<br>■ FPU<br>■ DMA controller<br>■ Fast ADC | ■ Sensorless FOC<br>■ Resolver FOC<br>■ Speed regulation<br>■ Postion regulation<br>■ Encoder FOC | ■ Highest dynamic response<br>■ High speed<br>■ Dynamic load | ■ AC servo drives<br>■ PLC<br>■ Mobile controllers<br>■ Process control |

**TC11xx family**

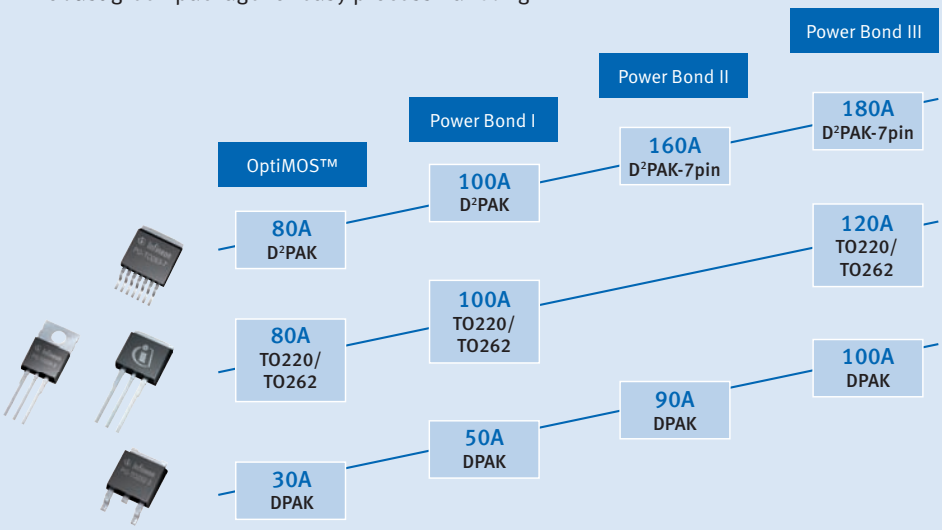
- 32-bit superscalar TriCore™ v1.3
- Available in 176-TQFP packages
- Two MAC units with DSP libraries
- PWM generation for up to five motors
- Peripheral control processor
- Single precision Floating Point Unit (FPU)
- Up to 1.5MB of embedded flash
- MultiCAN
  - Two CAN nodes
  - 64 message objects

# Automotive MOSFETs – Benchmark for Motor Control Applications

## OptiMOS™ Products are Best in Class

THE SUPERIOR PERFORMANCE OF Infineon's OptiMOS™ range is based on our leading MOSFET technology combined with the unsurpassed quality of a robust package:

- Best-in-class $R_{DS(on)}$ performance for increased system efficiency
- Highest current DPAK + $D^2PAK$ on the market for reduced ECU module size
- Lowest switching and conduction power losses for increased thermal system reliability
- Robust green package for easy process handling




Infineon Power Bond technology has improved the current capability of his Automotive qualified MOSFET packages.

## OptiMOS™ for Motor Control Solutions

OPTIMOS™ T2 30V, 40V, 60V PRODUCTS serve as future basic building blocks for any kind of half-bridge, H-bridge and 3-phase motor control solutions. Pair these products with Driver IC products to create your complete motor drive solution.

- Best-in-class $R_{DS(on)}$ performance for increased system efficiency
- Highest current DPAK + $D^2PAK$ on the market for reduced ECU module size
- Lowest switching and conduction power losses for increased thermal system reliability
- Robust green package for easy process handling

| | Voltage Class [V] | OptiMOS™-T2 (Trench) | OptiMOS™-T (Trench) | OptiMOS™ (Planar) |
|---|---|---|---|---|
| **Single MOSFET** | | | | |
| NEW! N-Channel | 30 | • | | • |
| NEW! N-Channel | 40 | • | • | • |
| N-Channel | 55 | | | • |
| NEW! N-Channel | 60 | • | | |
| N-Channel | 75 | | | • |
| N-Channel | 100 | | • | |
| NEW! P-Channel | 30 + 40 | • | | |
| **Dual MOSFET** | | | | |
| NEW! Dual N-Channel | 2 x 55 | | • | • |
| P+N-Channel | 30 + 55 | | • | |

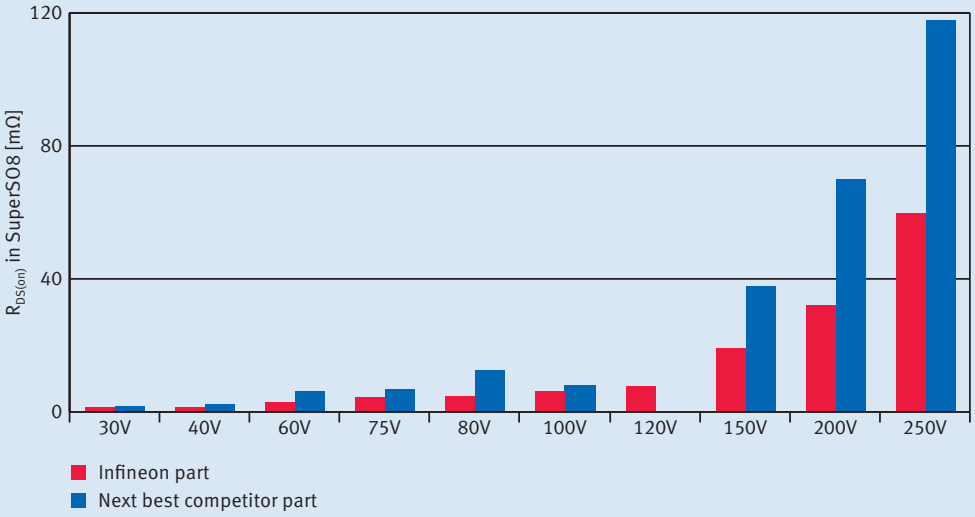
[www.infineon.com/automotivemosfet]

# Industry MOSFETs – Power Density for the Next Level of Energy Efficiency

INFINEON'S OPTIMOS™ FAMILY sets new standards for power MOSFETs, offering the industry's lowest $R_{DS(on)}$ and Figure Of Merit (FOM) in all voltage classes from 30V to 250V. Available in high-performance packages featuring state-of-the-art process technologies, the OptiMOS™ portfolio has the right product for all motor control applications.

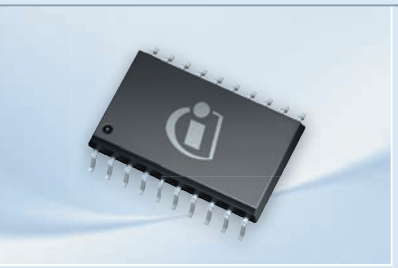
In this high-current and high-power application, lowest ohmic devices in D²PAK and TO-220 minimize conduction losses and reduce the need for device paralleling. This enables the highest power density, one of the major driving factors in motor control. OptiMOS™ products with very low $R_{DS(on)}$ values restrict cooling in the system, thus enabling smaller heatsinks to be used. This helps to reduce overall system costs.

OptiMOS™ products in high-performance space-saving packages like CanPAK™, SuperSO8 and S3O8 represent a further step towards higher power density. These products cut board space requirements by over 50 percent, and allow DC currents per device of up to 180A in CanPAK™, 100A in SuperSO8 and 40A in S3O8. The high current capability makes these products a perfect choice for motor control applications.
The OptiMOS™ family is also available in D²PAK-7Pin with extremely low on-state resistance and high current capability up to 180A.

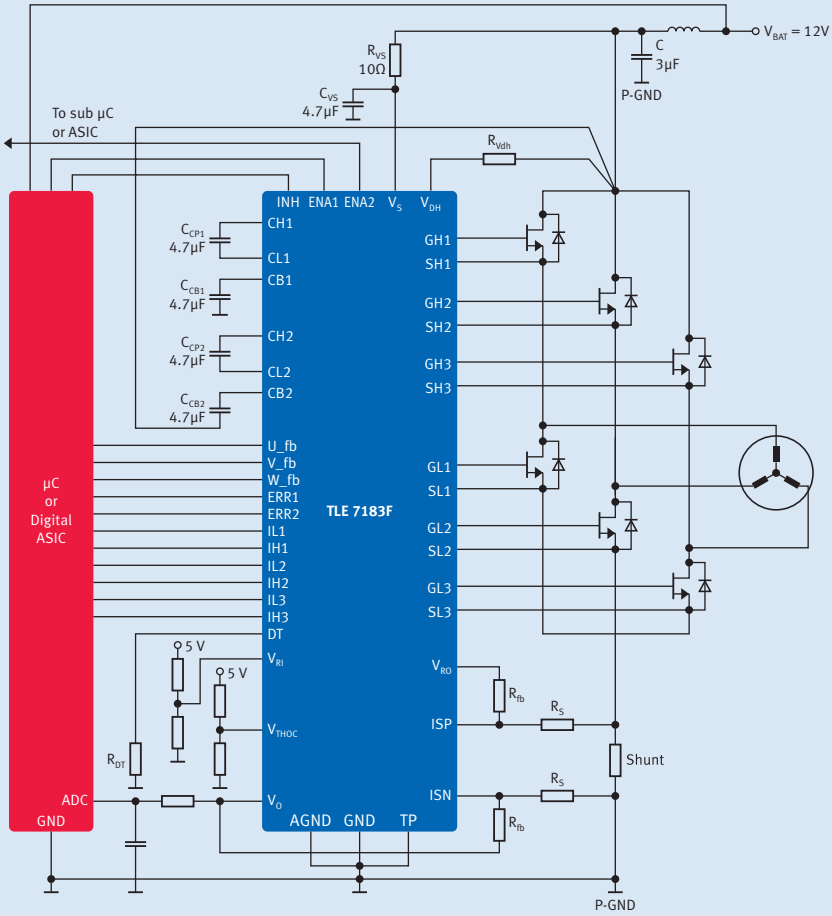



[www.infineon.com/industrymosfet]

# Bridge Drivers – H-Bridge and 3-Phase Gate Driver ICs



THE TREND TOWARDS GREATER EFFICIENCY in automotive applications also applies to electric motors. Applications such as power steering, HVAC compressors and engine cooling fans will be controlled by electronic motors in the future. Infineon's family of configurable, H-bridge and 3-phase gate driver ICs can be combined with MOSFETs to provide the power and efficiency these systems demand.



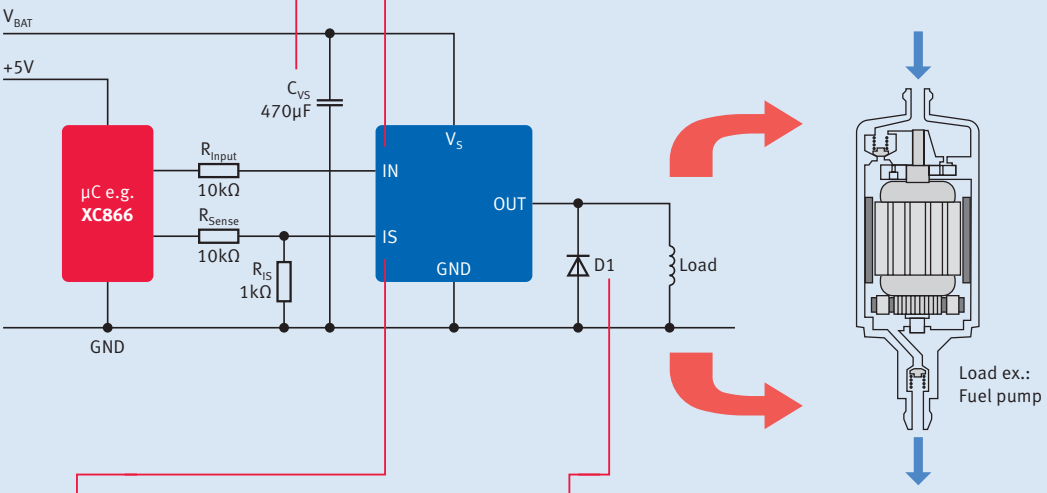

[www.infineon.com/driver-ic]

# Speed PROFET™ – Protected High-Side Switch for PWM-Driven Applications

THE SPEED PROFET™ BTF50060-1TEA is a high-side switch for high PWM frequencies such as 25 kHz. It can be used for controlling, driving and protecting a 12V DC motor (e.g. 100W) or valve. In combination with a freewheeling diode or a low-side switch, the Speed PROFET™ can be set up in a half-bridge or boost converter topology. It can be driven with a 25kHz PWM signal directly from a microcontroller. The Speed PROFET™ is capable of a duty cycle of 100%. The genuine feature set of the Speed PROFET™ simplifies hardware and software design. It includes protection functions like short-circuit and overtemperature shutdown and also offers an accurate load current measurement and open load or short-to-battery detection.

Capacitor for battery voltage stabilization

Voltage controlled input: The device can be driven directly from the mC



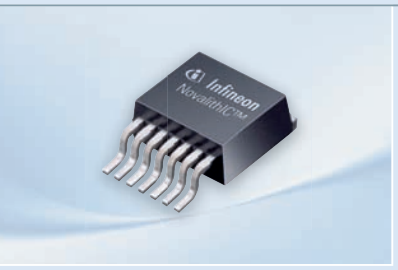

In ON state: Provides analog current sense signal in normal operation, with defined fault signal in case of overload, overtemperature and open load. Open load can be distinguished from other faults.
In OFF state: Provides open load and short-to-battery detection

Freewheeling diode: Necessary in case of inductive load

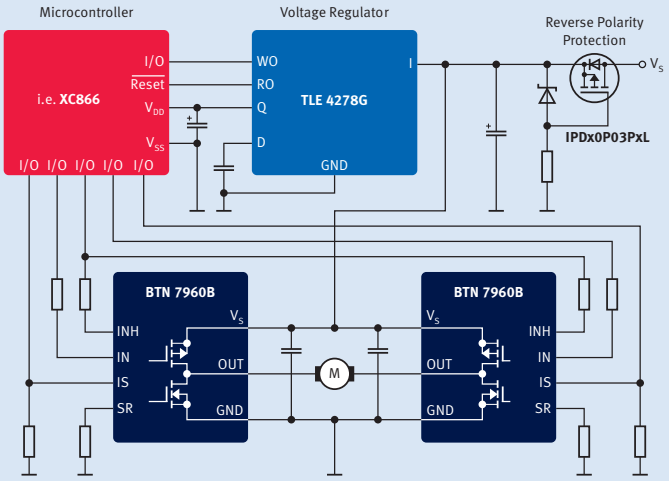
Samples available in Q2 2010

[www.infineon.com/profet]

## NovalithIC™ – Integrated Half-Bridge Driver



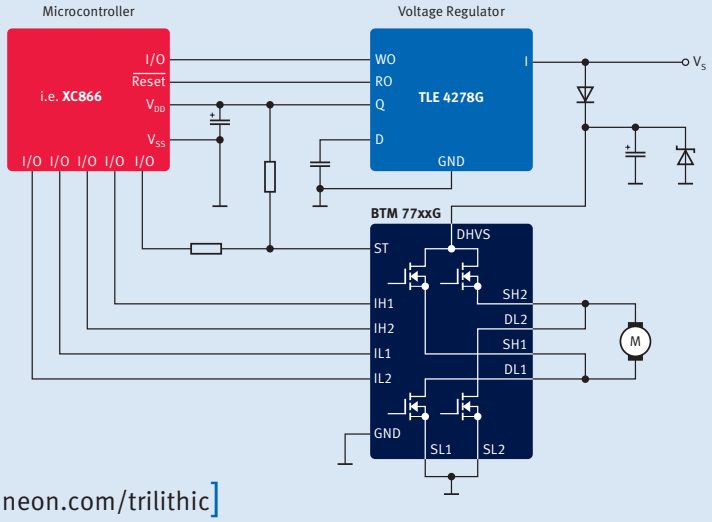
NOVALITHIC™ PROVIDES a complete low-ohmic-protected half-bridge (typ. path resistance @ 25°C from 28mΩ down to 16mΩ) in a single package. It can also be combined with an additional NovalithIC™ to create an H-bridge or 3-phase bridge. The NovalithIC™ family has the capability to switch to up to 25kHz while providing overcurrent, overvoltage and overtemperature protection. The NovalithIC™ family offers cost-optimized solutions for protected high-current PWM motor drives with very low board space consumption, scaled to your needs.




[www.infineon.com/novalithic]

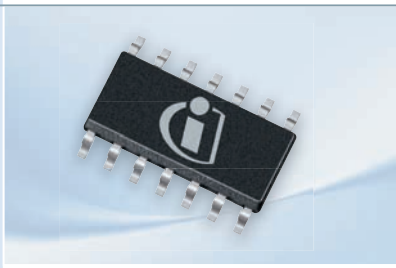
## Trilith IC – Integrated Full-Bridge Driver

THE TRILITH IC FAMILY MEMBERS combine two high-side and two low-side switches in one package. They are geared to drive high-current DC motors in an H-bridge configuration (peak currents of up to 42A), but can also be used as single independent switches. All Trilith ICs include overcurrent and overtemperature protection for the high-side switches. For the low-side switches the user can choose between fast unprotected switches as well as protected switches for lower frequencies (typ. path resistance @ 25°C from 210mΩ down to 40mΩ).

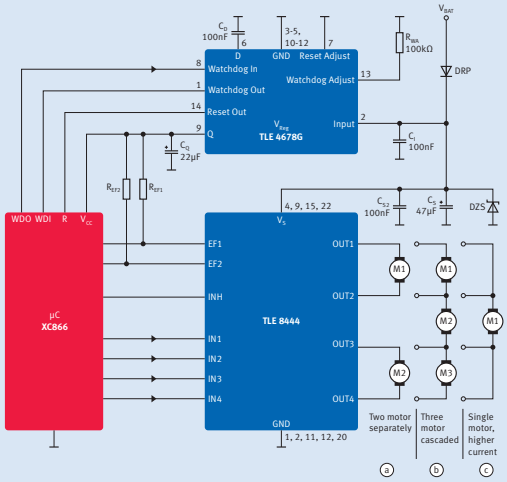



[www.infineon.com/trilithic]

## Multi Half-Bridges – Single-Chip Solutions for Low-Current Applications



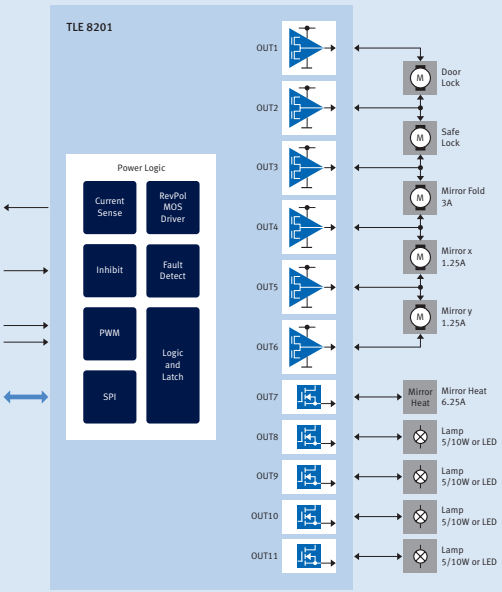
DC BRUSH MOTOR CONTROLS that drive low load currents (‹1A) are best implemented using cost-effective and PCB space-saving IC solutions. Infineon offers a broad range of half-bridge drivers from 2-fold half-bridge drivers with parallel interface in a DSO-14 pin package to a 10-fold half-bridge driver with SPI interfaces in a SSOP-24 pin package. All products have protection features implemented and allow diagnostics either via a statusflag or SPI. Typical applications include flap motors for climate control and motors for mirror adjustment or idle speed control.




[www.infineon.com/bridges]

## Half-Bridges and -Switches – Enhanced Reliability and Performance

SINGLE-CHIP SOLUTIONS for door zone modules to drive central door locks, mirror fold, mirror positioning, mirror defrosting plus 5 and 10W lamps.

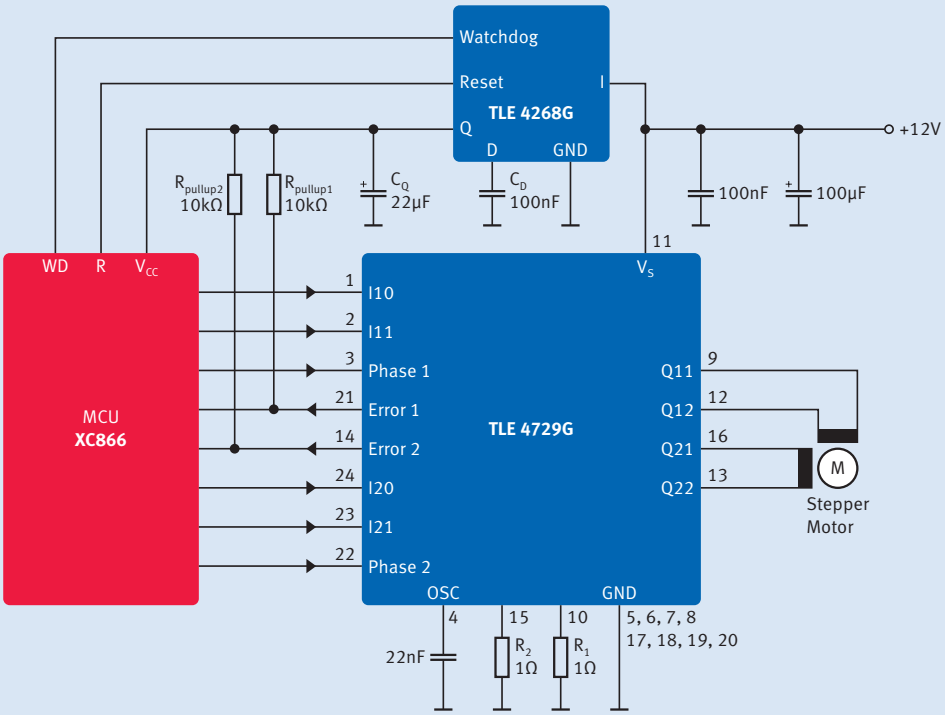



[www.infineon.com/door-module-ic]

## Stepper Driver – Cost-Efficient, Durable and Reliable

IN BODY ELECTRONICS, stepper motors are featured in headlight beam leveling and HVAC flap systems. They are also widely used in engine management systems. A typical application is rpm management, where a motor-driven valve in the bypass air inlet controls idling speed.

The Infineon stepper motor driver TLE 4729G is a bipolar, monolithic IC for driving bipolar stepper motors, DC motors and other inductive loads that operate by constant current. The control logic and power output stages for two bipolar windings are integrated on a single chip which permits switched current control of motors with 0.7A per phase at operating voltages up to 16V. The device offers failure diagnosis (e.g. open load, short circuit or over-temperature) via a status flag.




[www.infineon.com/bridges]

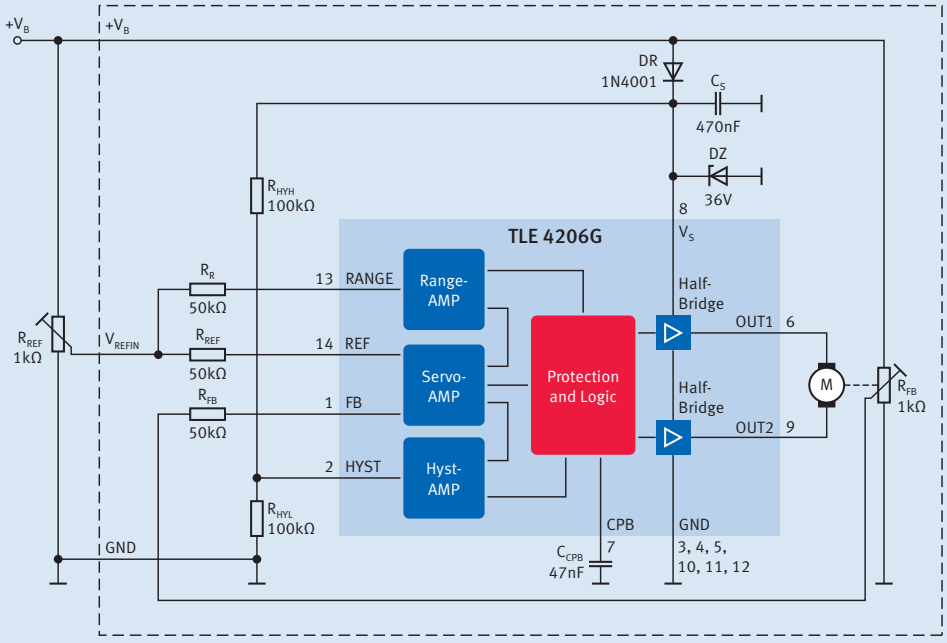
# Servo Driver – Robust and Reliable

THE SERVO DRIVER FAMILY comprises three devices, TLE 4206G, TLE 4206-2G and TLE 4209. They feature a fully integrated full-bridge with freewheeling diodes and smart power protection features for automotive headlight beam leveling control applications. The standard thermally enhanced power P-DSO-14 package leverages low RTH for environments with high ambient temperatures of 150°C.

In the TLE 4206G, the “programmable current-peak-blanking” disables the servo-loop during the VS voltage drop caused by the stall current spike. So there is no need of an electrolytic blocking capacitor at the VS-terminal.

The TLE 4206-2G is a design-version of the TLE 4206. In the TLE 4206-2G, the current peak blanking pin is disconnected. A hysteresis is introduced at the lower RANGE threshold. This allows reliable deactivation of the device by pulling the RANGE input to GND, also under critical application conditions.

Furthermore, the built-in features of the Infineon servo driver family such as over- and undervoltage lockout, short-circuit protection and overtemperature protection will open a wide range of automotive and industrial applications.



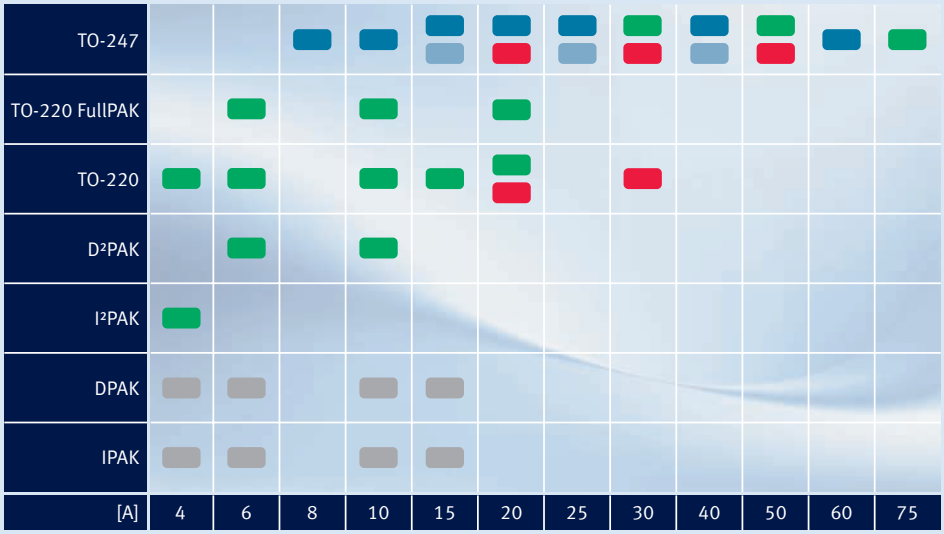

[www.infineon.com/bridges]

# IGBTs – For all Your Hard Switching Requirements

INFINEON'S 600V AND 1200V TRENCHSTOP™ IGBTs are the most efficient devices available today, making them ideal for applications where efficiency is a key issue. They are typically used in UPS and solar inverters as well as in welding and industrial drives up to 10kW.

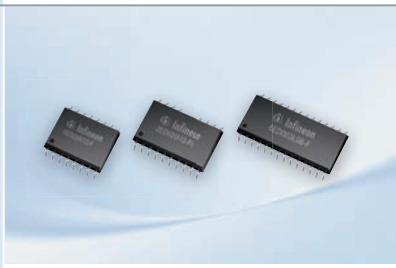
The new 600V RC-D (Reverse Conducting for Drives) family provides a cost-optimized space-saving solution in DPAK or IPAK up to 15A. They are perfectly suited for the white goods segment up to 2 kW, where cost and performance play an important role.

When operating at frequencies greater than 40kHz, the new 600V and 1200V third generation high-speed family (HS3) has low switching losses and excellent EMI performance.




[www.infineon.com/igbt]

# EiceDRIVER™ – Gate Driver IC for MOSFETs & IGBTs

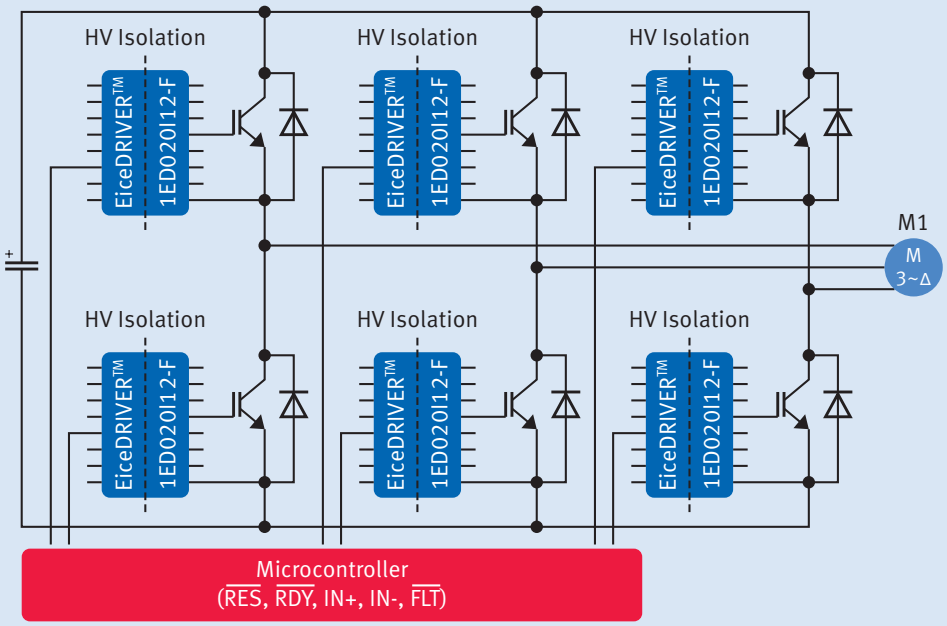


INFINEON OFFERS A NEW FAMILY OF EICEDRIVER™ IGBT / MOSFET gate driver ICs for applications from 600V up to 1200V blocking voltages. Based on innovative technologies such as thin-film silicon-on-insulator technology (600V) and coreless transformer technology (1200V), these products increase reliability levels, reduce losses and improve performance

Within this family, the 1ED020I12-F is a single-channel isolated IGBT / MOSFET driver IC provides galvanic isolation up to 1200V as well as feedback status outputs and integrated protection features. The 2ED020I12-FI, a half-bridge driver IC, allows galvanic isolation up to 1200V on the high-side channel. Reduced power losses compared with junction-isolated ICs makes this a reliable and cost-effective solution for advanced IGBT and MOSFET power stages. The 6ED003L06-F is a 600V 3-phase gate driver IC, which offers excellent ruggedness to negative transients to -50V.

**EiceDRIVER™ highlights:**

- 1200V single- and half-bridge gate driver ICs using CLT
- 600V 3-phase driver IC using thin-film SOI technology
- No degradation with coreless transformer technologyover time and temperature compared to optocouplers
- SOI technology allows -50V negative voltage transients
- Integrated protection and diagnostic feedback features




[www.infineon.com/gatedriver]

# High-Power Modules

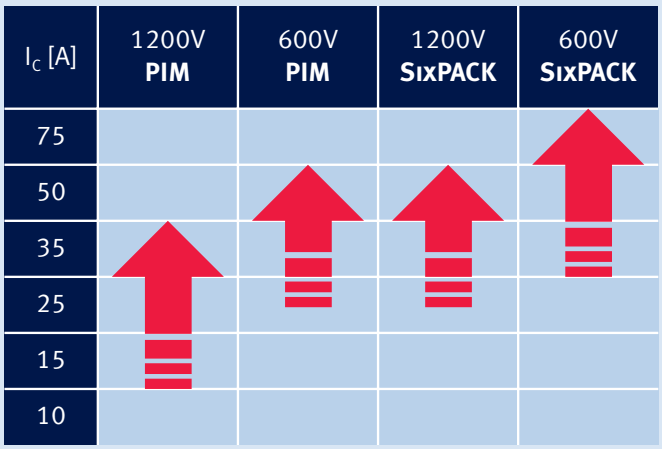
Variable speed drive systems play a key role in energy saving. Infineon contributes to your success by providing the latest chip technology and innovative module designs for a power range from 0.5kW up to more than 1MW. As examples in the low and medium power range, Infineon has recently introduced three new module platforms: the MIPAQ™, SmartPIM & SmartPACK and the EconoPACK™4. PrimePACK™ and IHM-B are new packages in the high-power segment.

## SmartPIM and SmartPACK – Flexible Assembly through Self-Acting PressFIT Technology

INFINEON HAS EXPANDED its PressFIT technology range to include SmartPIM and SmartPACK in a new housing concept.
The brand new housing allows the module to be connected with the heat sink and the PCB in a single mounting process. Here, the PressFIT pin is pressed into the PCB, the PCB is stabilized and the module is mounted on the surface of the heat sink in a single step. The whole mounting concept needs no additional tools; only an adapted screw driver has to be used. All conventional electrical circuits are feasible. The housing accommodates current up to 75A.

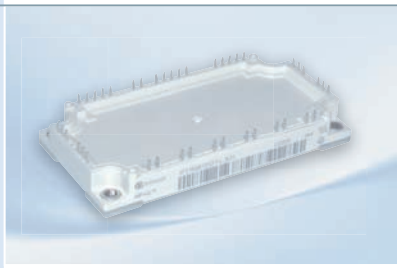
This module family provides all reliability characteristics from the established PressFIT technology as well as a range of advanced features:

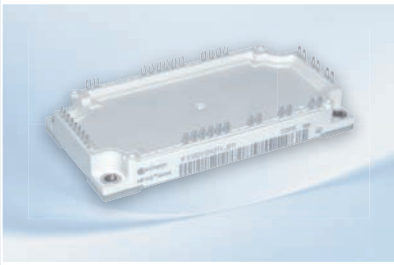
- Press-in process by simply tightening a single screw
- Flexible mounting
- The new module and mounting concept reduces process time
- Robust housing concept with decoupled DCB force
- Gas-tight contact so immune to ambient atmosphere
- Decreased FIT-rates for interconnections
- Reliable cold-welded connection of module pins and PCB
- Can be mounted on both sides of standard PCBs




[www.infineon.com/SMART]

# MIPAQ™– New Level of Extended Functionality and Integration



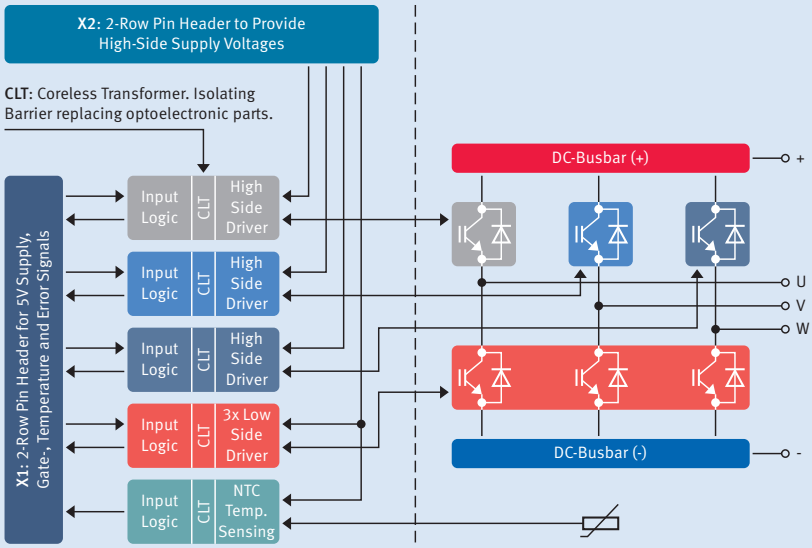


MIPAQ™ IS A NEW FUNCTIONAL PRODUCT FAMILY that enables electronics to be integrated into power modules.
These devices are a functional product family within Infineon's IGBT modules portfolio. An IGBT module combined with sensing and drive electronics makes this solution ideal for designing powerful and compact inverters for low and medium-power, low-cost applications. The resulting energy savings help improve profitability and protect the environment.

The MIPAQ™ family is based on IGBT modules and offers advanced functions for power ranges from 22kW-75kW:

- **MIPAQ™ base** module offers integrated shunts
- **MIPAQ™ sense** module offers additional current measurement feature, and is fully digital with galvanically isolated output signals
- **MIPAQ™ serve** module includes driver electronics

**MIPAQ™ serve functional diagram:**



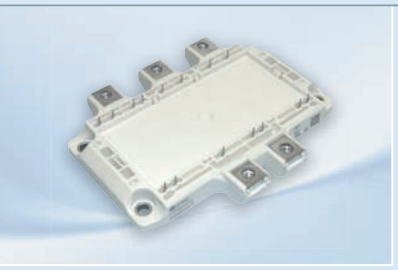

MIPAQ™ serve module is the 3-phase full-bridge IGBT module with integrated drivers and digital temperature measurement.

These functionalities enable the MIPAQ™ serve module to be a full plug-and-play solution for high-current drive applications. Inside the module, there are galvanically isolated drivers based on Infineon's coreless transformer technology. With the elimination of optical couplers, it will further enhance the modules' long-term stability.

The MIPAQ™ serve modules, based on the newly designed EconoPACK™4 and utilizing IGBT4, cover the 1200V range and manage currents of 100A, 150A and 200A. Screws are used for high-current connections. Standardized connectors are provided for supply voltage and logic signals for plug-and-play.

[www.infineon.com/MIPAQ]

# EconoPACK™4 – The New Standard for Compact Inverter Designs

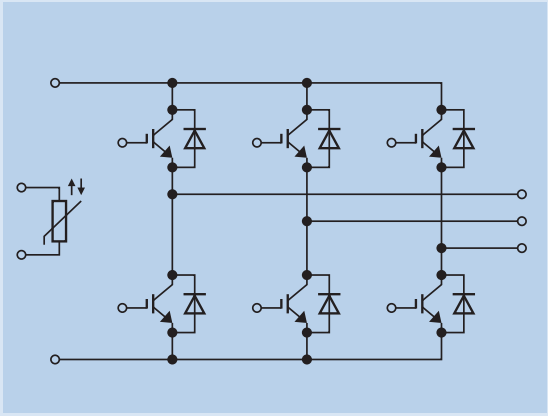


ECONOPACK™4 IS THE NEW MEMBER of the well known Econo modules product range.

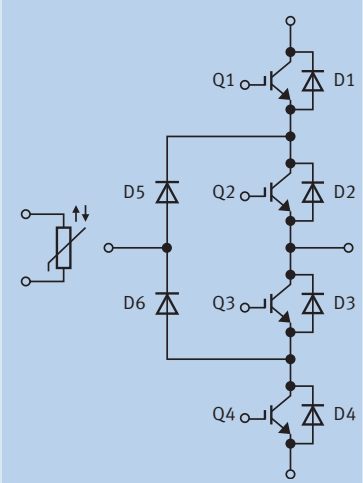
Combining screw power terminals with excellent electric connection, plus separated DC and AC links and PressFIT Control pins for solderless inverter assembly, the new EconoPACK™4 IGBT modules are the ideal choice for industrial applications.

- Superb reliability, conductivity and efficiency
- Low stray inductance design
- IGBT4 650V and IGBT4 1200V and 1700V chip technologies
  - Higher operation junction temperatures $T_{vjop}$ = 150°C
  - Up to 20% higher IRMS current compared to previous chip generations
  - Higher power cycling capability compared to previous chip generations
- Screw power terminals and PressFIT control pins
  - Solderless assembly using a simple and safe process
  - Reliable connection between PressFIT pin and metalization of PCB
  - Control pins can also be soldered for increased flexibility
- Robust design
  - New ultra-sonic welding of all power terminals and control pins
  - Injection-molded pins and pre-formed power terminals

**3-phase full-bridge (SixPACK) configuration:**
650V / 1200V: 100A, 150A, 200A
1700V: 100A, 150A



**3-level one-phase configuration:**
650V: 200A, 300A




[www.infineon.com/EconoPACK4]

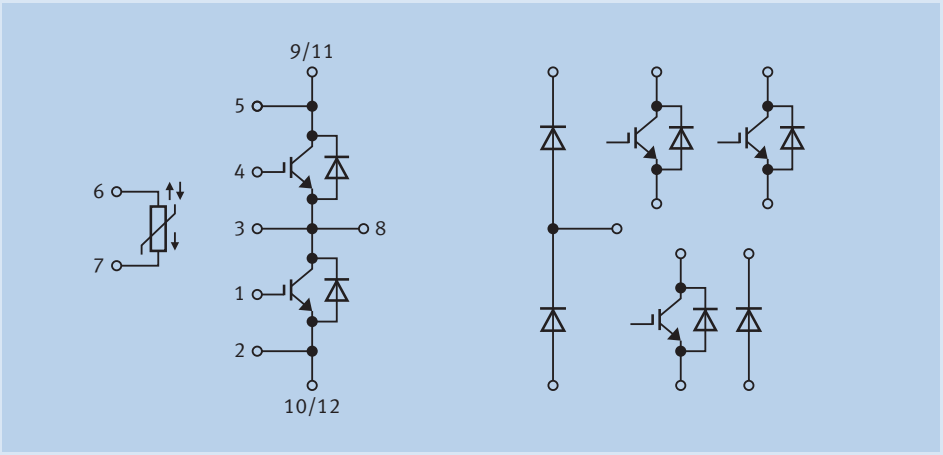
# PrimePACK™ and IHM-B – Revolutionizing Today's and Tomorrow's Designs

PRIMEPACK™ RECENTLY STANDARDIZED a novel approach in high-power inverter designs. The innovative housing utilizes a according heatsink that is more efficient than ever before. This module represents the first high-power module in the market with an embedded NTC sensor. The layout of the module also allows very compact high-power 3-level inverter topology configurations.

The new IHM-B meets today's reliability requirements inwell-known IHM high-power modules. As this module family is targeted for applications with harsh environment conditions, several new technologies have been implemented. In order to satisfy most designers, the IHM-B housing keeps the same outline as the corresponding IHM-A.

Key technologies implemented in both housings:

- Ultrasonically welded power and auxiliary terminals
- IGBT4 for 1200V and 1700V
- IGBT3 for 3300V
- Green products able to operate up to Tj=150°C




For excellent design flexibility, PrimePACK™ and IHM-B products are available in half-bridge or chopper configurations, where IHM-B is offered as single switch. Those two product families employ the very latest silicon technology and are available in the following voltage and current ranges:

PrimePACK™:

- 450A - 1400A for 1200V
- 650A - 1400A for 1700V

IHM-B:

- 1200A - 3600A for 1200V and 1700V
- 1000A - 1500A for 3300V

[www.infineon.com/PrimePACK]

# Microcontrollers – High- and Low-Voltage Products

## 8-bit Microcontrollers

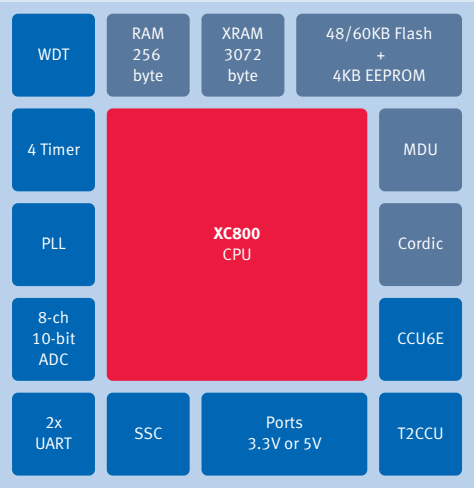
THE HIGH-PERFORMANCE XC800 FAMILY combines a dual-cycle 8051 core with embedded flash memory and powerful on-chip peripherals. It is well suited to for a wide range of 5V and 3V applications like motor controls, home appliances, lighting, automation and automotive systems. This rich family features flash sizes from 4KB to 64KB and pin counts from 20-pin to 64-pin. The XC800 family comes with innovative enhancements like FOC (Field-Oriented Control) and PFC. With full Class B compliance, it offers 16-bit performance at 8-bit cost.

## 16-bit Microcontrollers

MCU AND DSP IN A REAL-TIME CORE, Infineon's XE166 real-time signal controllers combine the traditional strengths of a Microcontroller Unit (MCU) to control peripherals with the computing power of Digital Signal Processors (DSP). All in one enhanced XE166 core. The new XE166 family gives embedded design engineers the benefit of twice the performance and fast embedded Flash offerings. Operating at up to 100MHz and one cycle per instruction, XE166 delivers 100 MIPS. The rich family features flash sizes from 192kB to 1.6MB and pin counts from 64-pin to 176-pin. Safety features like MPU, ECC & MCHK are on board.

## 32-bit Microcontrollers

TRICORE™ IS THE FIRST UNIFIED, single-core, 32-bit microcontroller DSP architecture optimized for real-time embedded systems. The TriCore™ Instruction Set Architecture (ISA) combines the real-time capability of a microcontroller, the computational power of a DSP, and the high performance/price features of a RISC load/store architecture.

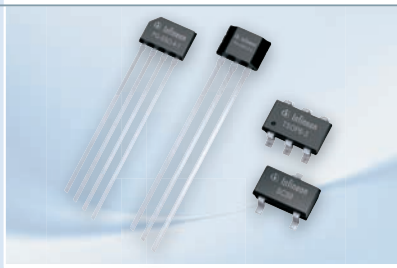



**Key Benefits**

- High performance
  - Zero wait stateflash
  - 16-bit vector computer operating at twice the CPU clock
- 64KB Flash Memory for programs and data
- CCU6 + T2CCU PWM timers
  - Capable of running multiple motors
  - 1 motor + PFC

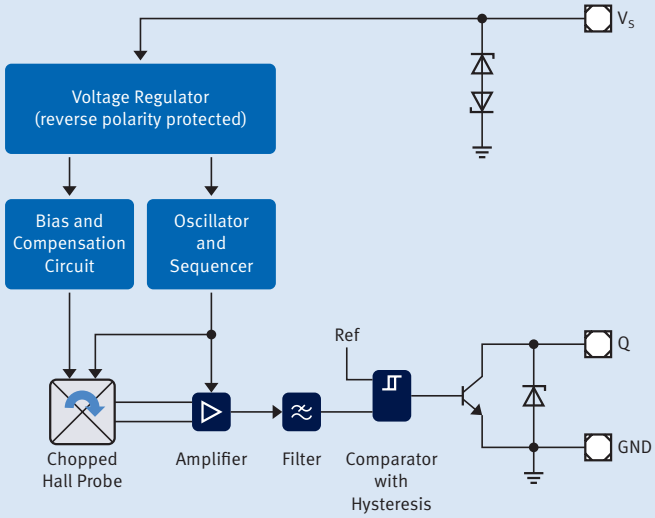
[www.infineon.com/microcontroller]

# Sensors – High- and Low-Voltage Products



## Hall IC Switches

THE TLE/TLI 49X6 IS A FAMILY OF HIGH-PRECISION, uni- and bipolar Hall-effect switches based on chopped Hall probes. These devices are optimized for automotive and industrial applications such as sensing, switching and index counting. The TLE/TLI 49x6 family offers enhanced accuracy and robustness against electrical disturbances. These products are available as two-wire sensors with current interface, unipolar switches, bipolar latches or double Hall-effect latches with speed signal and direction information. Tiny SMD packages and slim leaded packages are available for high flexibility in design.




## Linear Hall ICs

TLE 499X FAMILY OF LINEAR HALL ICS has been specifically designed to meet the requirements of highly accurate angular and linear position detection applications and current measurement applications. All products of our linear Hall family work on the basis of measuring the vertical component of a magnetic field. They generate an output signal directly proportional to the sensed magnetic field. They are available with analog or digital output interfaces such as PWM, SENT and SPC.

## GMR-Based Angular Sensors

THE TLE 5011/5012 ARE 360° ANGLE SENSORS capable of detecting the orientation of a magnetic field. Typical applications are angle sensing, position measurement and EC motor switching. Our angle sensor family is based on monolithic integrated Giant Magneto Resistance elements (iGMR). The data communication is accomplished with a bi-directional Synchronous Serial Communication (SSC) interface that is SPI-compatible. The TLE 5012 offers additional, selectable PWM, HSM and incremental output interfaces.

[www.infineon.com/sensors]

# Support Tools

## LIN STEPPER APPLICATION KIT [www.infineon.com/LINStepper]

**Key Features**

- XC866
  - PWM unit
  - Fast ADC with ‹200ns sample time
- Supporting 50 to 200mA stepper motor
- On-board stepper gauge
- Software package included to control the stepper motor and deploy your own design
- Free toolchain including compiler and debugger
- MiniWiggler for JTAG debug via USB interface
- Ready for LIN prototyping
- DAvE™-compatible software packages
- Suitable for Windows 98/2000/XP

**Applications**

- Instrumentation / gauges
- Multi-axis positioning
- Surveillance equipment
- CNC machining
- Printers
- Business machines

## XC800 FOC APPLICATION KIT [www.infineon.com/XC800FOC]

**Key Features**

- XC886 with vector computer
  - PWM unit
  - Fast ADC with ‹200ns sample time
- Discrete power inverter 24V, 1.2A
- 15W PMSM motor and plug-in power supply 24V
- Software package including source code for sensorless FOC of PMSM
- Free toolchain including compiler and debugger
- Real-time monitoring tool (USB to CAN bridge)
- DAvE™-compatible software packages
- Suitable for Windows 98/2000/XP

**Applications**

- Valve controls
- Gear motors

## BLDC (BRUSHLESS DC) APPLICATION KIT [www.infineon.com/BLDC]

### Key Features

- XC866
  - PWM unit
  - Fast ADC with ‹200ns sample time
- Power board 9V - 18V, 20A
- 50W PMSM motor and plug-in power supply 12V
- Uses Infineon NovalithIC™ BTN 7960B and TLE 4264 LDO
- DAvE™ Drive auto-code generator (fully functional application code) for
  - Block switching with Hall sensors and sensorless
  - Free toolchain including compiler and debugger
- Digital isolated real-time monitoring tool (USB to JTAG and CAN bridge)
- Tutorial videos showing how to use the kit
- Suitable for Windows 98/2000/XP

### Applications

- Water pumps
- Fuel pumps
- Fans
- Valves
- Power Tools

## DAVE™ DRIVE APPLICATION KIT [www.infineon.com/DAvEdrive]

### Key Features

- XC886 with vector computer
  - PWM unit
  - Fast ADC with ‹200ns sample time
- Power Board 23V - 56V, 7.5A
- 15W PMSM motor and plug-in power supply 24V
- Uses Infineon 6ED003L06 gate driver, BSC196N10, MOSFETs, CoolSET™ ICE3B0565 power supply and TLE 4264 LDO
- DAvE™ Drive auto-code generator (fully functional application code) for
  - Block switching with Hall sensors and sensorless
  - Sensorless FOC of PMSM
- Free toolchain integrated in DAvE™ Drive
  - Flexibly generates optimized code and is not based on static libraries
  - Configures Infineon's powerful and flexible motor control peripherals
  - Compresses a detailed user manual into a few mouse clicks
  - Helps designers to quickly and easily implement advanced motor control techniques on low-cost components
- Digital isolated real-time monitoring tool (USB to JTAG and CAN bridge)
- Suitable for Windows 98/2000/XP

### Applications

- Industrial motor controls
- Transportation systems
- Consumer motor controls
- Appliance motor controls

## FOC DRIVE APPLICATION KIT [www.infineon.com/FOCdrive]

### Key Features

- XC878 with vector computer
  - Two independent PWM units
  - Fast ADC with ‹200ns sample time
- XE164 real-time signal controller wit MAC unit
  - Three independent PWM units
  - Two independent fast ADCs with ‹200ns sample time
- Power board 23V - 56V, 7.5A
- 15W PMSM motor and plug-in power supply 24V
- Uses Infineon 6ED003L06 gate driver, BSC196N10, MOSFETs, CoolSET™ ICE3B0565 power supply and TLE 4264 LDO
- Software package including source code
  - Sensorless FOC of PMSM with XE164
  - Sensorless FOC of PMSM with XC878
- Free toolchain for XC878 and XE164 including compiler and debugger
- Digital isolated real-time monitoring tool (USB to JTAG and CAN bridge)
- DAvE™-compatible software packages
- Suitable for Windows 98/2000/XP

### Applications

- Industrial drives
- Fans, blowers
- Pumps

## 3-PHASE DRIVE APPLICATION KIT [www.infineon.com/3phasedrive]

### Key Features

- XC886 with vector computer
  - PWM unit
  - Fast ADC with ‹200ns sample time
- Power board 110V - 230V AC, 3A
  - Inverter with 375W – 750W
- Uses Infineon IKCS12F60 CIPoS™ 12A, CoolSET™ ICE 3B0565 power supply and TLE 4264 LDO
- Software package including source code
  - Sensorless FOC of PMSM
  - V/f control of ACIM for quick evaluation
  - Free toolchain including compiler and debugger
- Digital isolated real-time monitoring tool (USB to JTAG and CAN bridge)
- DAvE™-compatible software packages
- DAvE™ Drive-ready
- Suitable for Windows 98/2000/XP

### Applications

- Home appliances
  - Washing machines
  - Dishwashers
- Industrial motor controls
  - Pumps
  - Fans

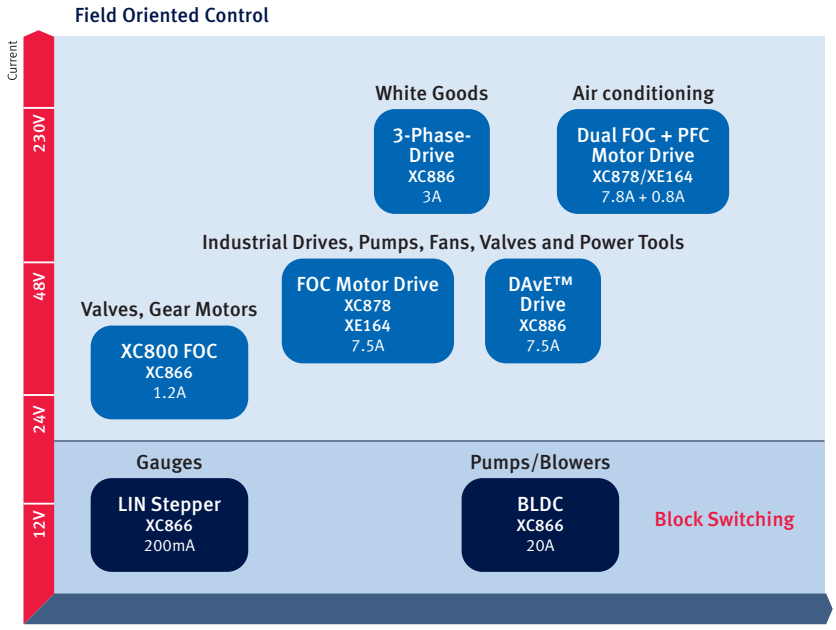
## DUAL MOTOR DRIVE APPLICATION KIT [www.infineon.com/2motordrive]

### Key Features

- XC878 with vector computer
  - Two independent PWM units
  - Fast ADC with ‹200ns sample time
- XE164 real-time signal controller with MAC unit
  - Three independent PWM units
  - Two independent fast ADCs with ‹200ns sample time
- Power Board 110V - 230V AC, 8A
  - Inverter A with 900W – 1800W
  - Inverter B with 100 - 200W
  - Boost converter for Power Factor Correction (PFC)
- Uses Infineon IKCS17F60 CIPoS™ 17A, 6ED003L06 gate driver, SPD04N50C3 MOSFETs, IDT08S60 SiC diode, SPA15N60C3 MOSFETs, CoolSET™ ICE3B0565 power supply and TLE 4264 LDO
- Software package including source code
  - Simultaneous control of two PMSM with sensorless FOC & digital PFC with XE164
  - Sensorless FOC & digital PFC with XC878
  - V/f control of ACIM for quick evaluation
- Free toolchain for XC878 and XE164 including compiler and debugger
- Digital isolated real-time monitoring tool (USB to JTAG and CAN bridge)
- DAvE™-compatible software packages
- Suitable for Windows 98/2000/XP

### Applications

- Air conditioning
- Industrial drives
- Fans, blowers
- Pumps
- White goods



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- USA ..... 1866 951 9519
- International ..... 00 800 951 951 951
- Direct access ..... +49 89 234 - 0 (interconnection fee)

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Published by
Infineon Technologies AG
85579 Neubiberg, Germany

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